

Product Directed Manufacturing Systems: Delivering the Benefits of IIoT

Ujigami PDMS software delivers the benefits of IIoT to manufacturing without the expense of purchasing new IIoT-enabled devices.



If you think the Internet of Things (IoT) is an overhyped technology—right up there with wearables and virtual reality—we wouldn't blame you. Depending on which market research study you read, the numbers are astonishing.

For example, consulting firm Bain & Co. expects global IoT spending to top \$300 billion by 2020, while Boston Consulting Group suggests a slightly more conservative figure of \$267 billion. Market research firm International Data Corp. (IDC) is even more bullish: It forecasts worldwide

spending on IoT technology to reach \$772.5 billion in 2018, an increase of 14.6 percent over the \$674 billion that was spent in 2017. IDC further expects that, during the next four years, worldwide IoT spending will continue to grow at a compound annual rate of more than 14 percent, reaching \$1.1 trillion in 2021.

For the uninitiated, the IoT is the idea of connecting devices—not computers, but rather appliances, phones, speakers, electric meters, thermostats, medical devices and other “things”—to the Internet and to each other. Research firm Gartner Inc. predicts that more than 26 billion “things” will be connected to the Internet by 2020, and some experts put that number even higher, at more than 100 billion.

If the notion of connecting your home refrigerator to the Internet seems like an expensive novelty, it probably is. However, the real promise of the IoT lies in what industry is doing with the technology now and what it will do with it in the near future. Indeed, of the \$772.5 billion that IDC expects to be spent on IoT technology in 2018, almost half will come from three sectors of the global economy: manufacturing, transportation (airlines, railroads, etc.) and utilities. This is the so-called Industrial Internet of Things (IIoT).

Manufacturers are using IIoT technology to oversee operations, optimize processes, track production assets, manage inventories and warehouses, conserve energy and resources, and make supply chains more efficient. Rather than connecting consumer electronics to the Internet, manufacturers are connecting sensors, pumps, valves, machining centers, robots, fastening tools, bar code scanners, RFID readers and myriad other devices.

Through IIoT technology, manufacturers are collecting and distributing production data in real time anywhere it's needed—from the shop floor to the C suite, from a factory in Alabama or Mexico to a corporate headquarters in New York, a parts supplier in China, or an equipment vendor in Europe. Manufacturers are collecting a variety of data: parts and raw materials coming in; finished product going out; capacity utilization; overall equipment effectiveness (OEE); and the performance of individual machine components, such as electric motors, to facilitate preventive maintenance.

Ultimately, the goal of the IIoT is to create “smart factories” with cyber-physical systems capable of autonomously exchanging information, triggering actions, and controlling each other independently. The idea is to enable fundamental improvements in manufacturing, engineering, material usage, asset management, supply chain management and product life cycle management.

This is no “flavor of the month” trend. Indeed, in 2015, consulting firm PwC surveyed more than 2,000 companies from 26 countries regarding their current and future plans for IIoT technology. The companies represented a variety of manufacturing sectors, including automotive, aerospace, chemicals and metals, as well as transportation and logistics.

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One-third of respondents said their company had already achieved advanced levels of integration and digitization, and 72 percent expected to reach that point by 2020. Moreover, 86 percent of respondents said that on the basis of their experience to date, they expected to see both cost reductions and revenue gains from their IIoT efforts. Nearly a quarter expected those improvements, in both cost savings and revenues, to exceed 20 percent over the next five years.

Ujigami: The Future Is Now

The success of IIoT requires the integration of smart, connected devices. However, manufacturers have billions of dollars of production equipment that was purchased prior to IIoT and without standard IIoT interfaces. This results in a significant challenge to connect existing equipment and realize the benefits. In fact, in a recent IoT Nexus survey, 77% of respondents stated interoperability is their biggest challenge.

Connectivity is one of the cornerstones of the Ujigami Product Directed Manufacturing System. Ujigami enables manufacturers to control, monitor, manage, and improve the productivity and quality of their manufacturing facilities. The next generation of manufacturing technology is available today.

Ujigami is purpose-built plant-floor software that offers product-directed manufacturing; advanced mistake-proofing; dock-to-dock management and control; a flexible manufacturing environment; fastest

plant-floor, device-level interfaces; total solution ownership; and global reach—without the need for sophisticated programming. With the ability to connect every device and machine, engineers can quickly and easily configure their specific manufacturing requirements simply by configuring fill-in-the-blank web pages. Engineers can select whatever hardware—a computer or mobile device—that is best for them and always be connected to the plant floor from anywhere. Engineers without any programming background can master Ujigami’s browser-based interface and familiar architecture, which uses process flow diagrams and control plan inputs to coordinate and control the functions of each machine and operator.

Flexible and scalable, Ujigami’s core module can be extended with integrated scheduling, customer-order interfaces, warehouse management, performance metrics, advanced management reporting, and supplier advanced shipping notices (ASN).

Ujigami also integrates seamlessly with all other manufacturing software systems, including MRP, ERP scheduling and finance systems, to coordinate the functions of each system and report results to the entire organization. Often, a company can simplify its software environment by replacing several existing software systems with the comprehensive capabilities of Ujigami.

Ujigami software provides easy-to-use, real-time control of any manufacturing environment to deliver products with zero defects. With advanced knowledge of how to produce each individual part, Ujigami eliminates both common cause and special cause sources of variation. The software system includes both behavioral mistake-proofing and technical mistake-proofing of all product and process requirements to ensure each part is manufactured to its unique specifications before releasing the part for shipping.

How does this work? Let’s say an operator must build several variations of a product in sequence on an assembly line. When the

product arrives at the workstation, Ujigami configures the machine(s) and displays graphical work instructions showing the operator how to build it. Then, Ujigami can direct a pick-to-light verification system to ensure that each component is selected correctly. Next, the software can interface directly to a torque controller to ensure that the right number of fasteners is installed at the correct torque/angle and in the correct sequence. Any other devices or equipment required to produce the part are similarly controlled. At any step, the operator is notified immediately if product specifications are not met, prevented from continuing to produce a bad part, and shown how to fix the problem. Finally, Ujigami can signal a printer to produce a label with a bar-coded serial number for the operator to verify and place on the part.



This standard functionality can be accomplished without any PLC programming required. Ujigami interfaces directly with sensors, torque controllers and other equipment, the label printer and scanner to ensure that the operator:

- assembles the correct components,
- builds the part correctly in the correct sequence,
- does not work upstream,
- does not fall behind and miss a job,
- is qualified to operate the equipment,
- is notified of any equipment or process failures, and
- reacts correctly to problems and errors.

Because the software interfaces quickly and seamlessly with each device, the operator is not slowed down by the system. Ujigami disables equipment until the part is “in station” to prevent unauthorized operation of equipment and building ahead. If the operator is unable to complete his job in the allotted cycle time, Ujigami can automatically prevent the part from leaving the workstation by stopping the conveyor or locking the part in the station. (If desired, the software can simultaneously send an

email or other alert to a supervisor.) Ujigami does not intrude into the operator's actions unless there is a potential defect. The operator works at their pace within the takt time set for the line.

Ujigami tracks the quality of each serialized part through the entire assembly process to ensure zero defects prior to shipping. Browser-based reporting provides up-to-the-second status information highlighting production and quality concerns before they affect shipping schedules. The software operates continuously with minimal maintenance, support, and computing resources.

Ujigami's latency to respond to plant floor activities is measured in milliseconds—fast enough to keep pace with the most advanced PLCs and equipment. Operators and machines don't waste time waiting for the system to store data or determine the next requirement. Additionally, the software is completely device-agnostic—providing the ability to control all plant-floor equipment to deliver a

comprehensive, integrated manufacturing environment.

Connecting hardware is easy. Engineers and technicians can quickly configure a new device by following the prompts on an Ujigami web page. Ujigami communicates to each device in its native protocol, be it proprietary or compliant to one of the new IIoT standards. Engineers simply connect plant-floor devices (torque controllers, PLCs, presses, pick-to-light systems, sensors, conveyors, measurement devices, testers, etc.) to their Ethernet backbone, and Ujigami communicates with those devices in real-time.

To understand the benefits of Ujigami in the real world, it's useful to look at an example. A Tier 1 automotive supplier recently deployed Ujigami to transform its plant from a manual system with excess inventory and poor productivity into a highly integrated plant with world-class OEE. The client witnessed double-digit gains in labor efficiency with a similar improvement in quality metrics. Ujigami

controls the movement of all material from receipt through kitting and final consumption. Furthermore, it automatically stores work-in-process in an automatic storage and retrieval system and moves material to the point of use by automated guided vehicles. Robust mistake-proofing ensures that all operations—including injection molding, high-speed robotic assembly and manual assembly—produce defect-free parts.

The proliferation of “smart” and IIoT production technology is enabling manufacturers to collect real-time information about their products and processes, and, more importantly, to use that data to improve. Software like Ujigami

PDMS interfaces directly to these IIoT enabled devices and legacy equipment, going beyond simple data collection to create an intelligent manufacturing environment that is helping manufacturers increase quality, reduce costs and decrease time to market.

For manufacturing operations large and small, now is the time to implement a Product Directed Manufacturing system. For more information, call Tutelar Technologies at 905-331-6808, email sales@watchover.us, or visit www.zerodefektmanufacturing.com.

